550

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

EDITED AND ISSUED MONTHLY BY
THE INSTITUTION OF ELECTRICAL ENGINEERS
IN ASSOCIATION WITH
THE PHYSICAL SOCIETY
THE AMERICAN PHYSICAL SOCIETY
THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

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ABSTRACTS 2280–2461

Vol. 46 OCTOBER, 1943 No. 550

IMMEDIATE DELIVERY OF MERCURY DIFFUSION PUMPS

Characteristics	Type 2	Type 3
Speed litres per second	6-8	2-3
Ultimate vacuum, mm. Hg	10^{-6}	10^{-6}
"Backing" pressure, mm. Hg	0·5	0·5
Heat input, watts	300–500	150–200
Mercury charge, c.cs.	50	20
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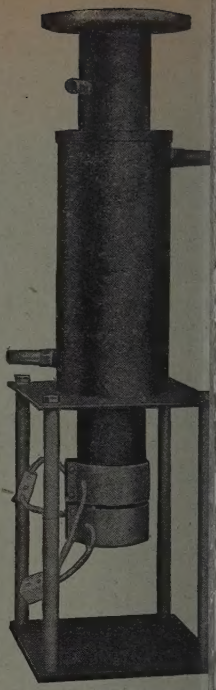

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MATHEMATICS

2280 51 : 581

Outline of a new mathematical approach to general biology. II. RASHEVSKY, N. *Bull. Math. Biophys.*, 5, *pp.* 49–64, *June*, 1943.—[See Abstr. 1555 (1943)]. Another formal principle is added, similar in its form to Hamilton's principle in mechanics, and based on a mathematical formulation of a postulate, that the events in the living world are determined by the requirement of the max. of the total flow of energy. The principle is applied to a wide number of biological phenomena, including palaeontologic developments, relations betw. death and birth rates of organisms, ontology, cell division, etc.

2281 51 : 581

On the form of plants and animals. RASHEVSKY, N. *Bull. Math. Biophys.*, 5, 2, *pp.* 69–73, *June*, 1943.—The expression for the form of organisms in terms of their biological functions, outlined in a previous paper, is carried out more in detail. Making definite assumptions about functions left arbitrary in the previous paper, expressions for different shapes of plants are derived. The relation between the amount of nervous tissue and the form of an animal is discussed in detail.

2282 511.261

Some theorems on residues. MENON, P. K. *Proc. Indian Acad. Sci. A*, 17, *pp.* 107–113, *April*, 1943.—Four theorems concerning transformations of the residues of 2^{p-1} and $(p-1)!$, mod. p^2.

2283 511.5

A sufficient condition that a C-characteristic be geometric. HUFF, G. B. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 198–200, *June*, 1943.

2284 512.972 : 621.315 : 621.3.012.8

Steady-state and hunting equivalent circuits of long-distance transmission systems. KRON, G. *Gen. Elect. Rev.*, 46, *pp.* 337–342, *June*, 1943.—[Abstr. 2007 B (1943)].

2285 516.3 : 541.123.6

Mixed-solvent extraction. WIEGAND, J. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 380–383, *June* 15, 1943.—The methods of analytical geometry are applied to the solution of 4-component-system-problems. The equilateral tetrahedron is distorted to a tetrahedron of 3 isosceles rt.-angled triangular faces, which tetrahedron is placed on an *x-y-z* rectangular co-ordinate system. Equations are derived in terms of general properties of liquid-liquid equilibrium systems.

See Abstr. 2346 518.3 : 536.212.3

2286 518.3 : 621.396.822

Chart for radio noise. SOWERBY, J. McG. *Wireless Engr*, 20, *pp.* 327–330, *July*, 1943.—[Abstr. 2146 B (1943)].

2287 518.4 : [542.67 + 541.12 + 576.8]

Correlation of rate data DEWITT, C. C. *Industr. Engng Chem.*, 35, *pp.* 695–700, *June*, 1943.—Growth curves are applied to the correlation of data from chemical engineering unit operations. The growth equations are fundamental in many fields of science and their present application involves a re-interpretation of the significance of both variables and constants. The equations are almost identical with those of chemical kinetics, radiation, electrical phenomena, etc. The Gompertz equation is applicable to growth data which show a max. at 37%; the simplified logistic equation has a point of inflection at *ca.* 50%, but the more complicated forms allow the point of inflection to vary over a wide range, while the curve may be symmetrical or asymmetrical. Any process in which an action begins slowly, speeds up, and then dies away, may be interpreted mathematically by these equations. H. H. HO.

See Abstr. 2390 519.21 : 539.215.4

2288 519.24 : 620.11

The application of statistical methods to the quality control of materials and manufactured products. BELZ, M. H., CORNISH, E. A., AND STEWART, A. L. *J. Instn Engrs, Aust.*, 15, *pp.* 53–62, *March*, 1943.—[Abstr. 1993 B (1943)].

2289 519.271.3

A note on the problem of *k* samples. NAIR, K. R. *Curr. Sci.*, 12, *pp.* 112–113, *April*, 1943.

2290 519.3 : 531.314 : 581

Note on the Hamiltonian principle in biology and in physics. RASHEVSKY, N. *Bull. Math. Biophys.*, 5, *pp.* 65–68, *June*, 1943.—A suggestion is made to establish a general variational principle of which the recently discussed principle of maximum energy exchange in biology and the usual Hamiltonian principle in physics would be particular cases.

2291 519.41 : 541.62

An application of group theory to isomerism in general. HILL, T. L. *J. Chem. Phys.*, 11, *pp.* 294–297, *June*, 1943.—By making use of Polya's theorem and the groups of symmetries of the geometrical models representing unsubstituted parent compounds, it is possible to include the various kinds of isomerism in a single discussion. The number of isomers calculated by this procedure is the total number of all types.

2292 519.52

On a statistical generalization of metric spaces. WALD, A. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 196–197, *June*, 1943.—[See Abstr. 1310 (1943)].

2293 519.54

Some topologically invariant metric properties. MILGRAM, A. N. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 193–195, *June*, 1943.—According to the duality theorem of Alexander, each simple closed curve C in Cartesian n-space E_n is linked by an n-2 cycle Z in E_n–C. It is shown that Z can frequently be taken to be a metric n-2 dimensional sphere. A generalization is formulated which holds in an arbitrary metric space.

ASTRONOMY. GEODESY

2294 523.78 : 621.396.812.5

A note on field strength of Delhi 3 and Delhi 4 at Calcutta during the solar eclipse of September 21, 1941. CHAKRAVARTI, S. P. *Proc. Inst. Radio Engrs, N.Y.*, 31, *pp.* 269–270, *June*, 1943.—[Abstr. 1936 B (1943)].

2295 525.11

The determination of the Earth's gravitational field. Second Paper. JEFFREYS, H. *Mon. Not. Geophys. Suppl. Roy. Astr. Soc.*, 5, 3, *pp.* 55–66, 1943.—The data [Abstr. 474 (1941)] are rediscussed by a more sensitive method for detecting variation of gravity capable of being repr. by spherical harmonics of low degrees. All cross (non-diagonal) terms in the normal equations for the coefficients are neglected. The variation shows no relation to the elevation of the surface and is inconsistent with accurate compensation. A new determination of the const. and the main ellipticity terms is made.

2296 525.11

The stress differences in the Earth's shell. JEFFREYS, H. *Mon. Not. Geophys. Suppl. Roy. Astr. Soc.*, 5, 3, *pp.* 71–89, 1943.—The stress differences needed to support given surface loads due to harmonics of degrees 2 and 3 are estimated on 4 hypotheses: (1) elastic loading of a uniform sphere; (2) inelastic loading of a uniform sphere, with continuous stress at the centre; (3) and (4) inelastic loading of a sphere with no stress-differences within distances $0{\cdot}545a$ and $0{\cdot}9a$ of the centre, a being the radius. Combining the results with the obs. distribution of gravity, the strengths needed on (3) are 150×10^6 dynes/cm.^{2} at depths to about $0{\cdot}1a$ and 80×10^6 dynes/cm.^{2} to the core. On (2) strengths of 330×10^6 dynes/cm.^{2} are needed throughout the outer $0{\cdot}1a$. The uncertainty of the coeff. of P_2 in gravity found from the precessional const. by de Sitter's method is estimated from the variation of gravity in other harmonics not consistent with the hydrostatic state.

PHYSICS: GENERAL

See Abstr. 2436 53 : 541.6

2297 531.19 : 541.123.4

Some remarks on the statistics of binary systems. WANNIER, G. H. *Proc. Roy. Soc. A*, 181, *pp.* 409–411, *July* 28, 1943.—Discusses the results [Abstr. 1010 (1942)] concerning a binary body-centred cubic system. The method used should and does partly cover both the 2-phase system and the case of superstructure.

2298 531.19 : 541.123.4

On the statistics of binary systems. FUCHS, K. *Proc. Roy. Soc. A*, 181, *pp.* 411–415, *July* 28, 1943.—A reply to Wannier's criticism [Abstr. 2297 (1943)].

See Abstr. 2290 531.314 : 581 : 519.3

2299 531.714.7 : 676

Proving-in paper micrometer. FINCH, J. M. *Bell Lab. Rec.*, 21, *pp.* 121–122, *Jan.*, 1943.—It has been proposed that a dial micrometer would be a satisfactory alternative instrument to pressure-adjusted machinists' micrometers and more easily manipulated; to determine the comparative merits of these devices, tests were undertaken and the results are discussed.

E. R. A.

2300 531.724

The specific surface of powders. A modification of the air-permeability method for rapid routine testing. RIGDEN, P. J. *J. Soc. Chem. Ind., Lond., pp.* 1–4, *Jan.*, 1943.

2301 532.13

Fluidity of mixtures which obey Bachinskii's law. KOTTLER, F. *J. Phys. Chem.*, 47, *pp.* 277–292, *March*, 1943.—In all cases examined but one, the curves fluidity *v.* mole fraction are sagging. The ideal curves are not straight lines, but sagging. The deviations from linearity become too small for detection in the cases of pairs which do not differ appreciably in their constants. The sagging of the fluidity curves increases and that of the viscosity curves decreases with increasing temperature.

See Abstr. 2314 532.133 : 533.16

2302 532.137

A new recording viscometer for paint-consistency measurements. WICKER, C. R., AND GEDDES, J. A. *Bull. Amer. Soc. Test. Mater., pp.* 11–18, *Jan.*, 1943.

See Abstr. 2407 532.516 : 621.89 : 539.62

2303 532.542.1 : 532.631

A note on the motion of a mercury index in a capillary tube. GREEN, H. G. *Phil. Mag.*, 34, *pp.* 393–395, *June*, 1943.—A method of analysis alternative to that given by Yarnold [Abstr. 1020 (1940)] for the motion of a mercury index in a capillary tube is given. The present analysis is based upon consideration of the tractive force betw. the surface of a pipe and liquid flowing through it; it extends the velocity range of applicability of the theory and shows that the motion of a finite index has the same characteristics as that of continuous liquid.

J. S. G. T.

2304 532.543 : 532.591

Effect of turbulence and channel slope on translation waves. KEULEGAN, G. H., AND PATTERSON, G. W. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 461–462, *June*, 1943.—[See Abstr. 2538 (1942)]. The basic equation of motion for gradually varied unsteady flow in prismatic channels is derived from fundamental principles. The effect of the velocity distribution in the original undisturbed current on the motion of short waves is investigated, and the effects of wave height, curvature of profile, and fluid friction on the celerity of a wave-volume element is analysed in detail. The deformation of a straight sloping front and the change of height of an abrupt wave front is treated. Special emphasis is laid on disturbances of negligible curvature and practical methods of handling engineering problems arising in connection with the operation of locks or hydro-electric canals are given.

2305 532.57

The effect of installation on the coefficients of Venturi meters. Final report. PARDOE, W. S. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 337–349, *May*, 1943.—[See Abstr. 30 B (1937)].

See Abstr. 2304 532.591 : 532.543

2306 532.6/.7 : 576.35

A mechanism of division of a cell with an impermeable membrane. LANDAHL, H. D. *Bull. Math. Biophys.*, 5, *pp.* 75–81, *June*, 1943.—The case of a cell in which metabolites are produced and consumed within the cell, without leaving the cell, is considered. Conditions are given under which there may be an excess production at the centre over that at the periphery, and this condition is stable with respect to displacement of the centre. The resulting diffusion forces are considered, and an expression is developed

for the rate of elongation with time. [See Abstr. 2539 (1942)].

2307 532.613.4

The equilibrium between lens and uni-layer in the system hydrocarbon-oil/oleic-acid/water, in relation to the interfacial film. HEYMANN, E., AND YOFFE, A. *Trans. Faraday Soc.*, 39, *pp.* 217–219, *July–Aug.*, 1943.—The final spreading-coeff. of hydrocarbon oil, containing oleic acid as a spreader, on water is negative. It is suggested that this is related to the fact that the lateral adhesion betw. the spreader molecules is smaller in the interface than in the surface. The relation betw. surface and interfacial pressure, when a lens of hydrocarbon oil containing oleic acid is in equilibrium with a surface film of oleic acid, is discussed.

2308 532.62

The veratrine alkaloids. XVIII. Surface-film studies. ROTHEN, A., AND CRAIG, L. C. *J. Amer. Chem. Soc.*, 65, *pp.* 1102–1106, *June*, 1943.—A study of the surface films of certain veratrine alkaloids has been made. Molecular dimensions calculated from the film measurements indicate the structure to be such that the six hydro-aromatic rings indicated to be present in the alkaloids are so arranged that a max. length (18 Å) and min. cross-sectional area (47 Å^2) are obtained. The dimensions agree with theoretical values. Solanidine was included. Its molecular dimensions proved to be approx. the same.

See Abstr. 2303 532.631 : 532.542.1

2309 532.694.1 : 541.182.2

Foam and emulsion stabilities. ROSS, S. *J. Phys. Chem.*, 47, *pp.* 266–277, *March*, 1943.—The unit of foaminess for static foams is redefined. Foams of Aerosol OT and lauryl sulphonic acid are shown to conform to the usual logarithmic relation for drainage. An approx. equation for drainage of a foam or emulsion is developed theoretically and shown to fit some data on demulsification. Mechanisms for demulsification of stable and unstable emulsions are postulated. The application of a theoretical drainage equation to data on foam stability indicates a linear relation in some cases between film rupture and time.

2310 532.739.2

The solubility of hydrogen at low pressure in iron, nickel, and certain steels at 400° to 600°. ARMBRUSTER, M. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1043–1054, *June*, 1943.—The solubility of H was measured over a range of pressure from 0·001–1·5 mm. in carefully pre-treated samples of alpha-iron (initially carbonyl iron), Ni and certain steels at 400°, 500°, 600° and up to 350 mm. in Fe at 600°. The solubility in the low-alloy steels differs little from that in pure Fe. A method of calculating the amount of residual H from a suitable plot of the actual measurements is presented. Comparison by extrapolation of the new results with data in the literature shows a general accord, particularly at temperatures of 600° and higher.

2311 532.739.2

Complex ions. IV. Monammine-silver ion. VOSBURGH, W. C., AND MCCLURE, R. S. *J. Amer. Chem. Soc.*, 65, *pp.* 1060–1063, *June*, 1943.—[See Abstr. 2930 (1942)]. Measurements of the solubilities of Ag_2SO_4, $AgBrO_3$, and $AgIO_3$ in very dilute NH_3 solutions confirm the conclusion that a monammine silver ion exists. Its instability const. is $4{\cdot}3 \times 10^{-4}$. Recalculation of previous data gives $6{\cdot}2 \times 10^{-8}$ for the equilibrium const. for the dissociation of the diammine Ag ion into Ag ion and NH_3.

2312 532.739.2

The solubility of ammonium bromide in alcoholic solvents. BEDWELL, M. E. *Trans. Faraday Soc.*, 39, *pp.* 205–206, *July–Aug.*, 1943.—The solubility of NH_4Br in methyl, ethyl and *n*-propyl alcohols was accurately determined betw. 0°C. and a few deg. below the b.p. of the saturated solution. The solubility/temperature curve for each solvent shows a definite break betw. 30°C. and 40°C., attributed to a change in the degree of solvating power of the solvent.

See Abstr. 2382 532.771 : 539.133

2313 533.15 : 612.2

An apparatus for measuring air flow during inspiration. LEE, R. C., AND SILVERMAN, L. *Rev. Sci. Instrum.*, 14, *pp.* 174–181, *June*, 1943.—The instrument consists of a microscopic Pt wire suspended across the dia. of a 31·6 mm. tube. One end of the wire is attached to a fixed point and the other end to a fine spring. The displacement of the wire when air flows through the instrument is recorded photographically by a moving-paper camera. The deflection of the wire is linear with air flow, and its inertia, lag and frequency of vibration do not interfere with respiratory measurements. A low-resistance valve and mask system complete the apparatus.

2314 533.16 : 532.133

Correlating fluid viscosity. SMITH, A. S., AND BROWN, G. G. *Industr. Engng Chem.*, 35, *pp.* 705–711, *June*, 1943.—An equation derived from the theorem of corresponding states is applied to viscosity/temp. data of gases and liquids at atm. pressure, under saturated conditions and under pressure to determine its value in extending fluid viscosities. The equation is applicable to homologous series and diatomic gases. The viscosities of ethane and propane at 100–5 000 lb./in.^{2} and 15° to 200°C. were determined by the rolling-ball viscometer.

2315 533.22

A new Boyle's law apparatus. FREEMAN, I. M., AND MEISSNER, K. W. *Amer. J. Phys.*, 11, *pp.* 132–134, *June*, 1943.—The device is based on the Melde capillary barometer, and employs a tube permanently mounted on an axle so that it can rotate in a vertical plane. The tube is fixed at various angles to the vertical and in each instance the position of the outer end of the air space is marked on a piece of paper mounted on a board behind the tube. If all the points lie on an ellipse, this constitutes a verification of Boyle's law.

2316 533.275

Humidity data expressed in grains water vapour per pound of dry air. STANSFIELD, E. *Canad. J. Res. A*, 21, *pp.* 51–55, *May*, 1943.—Tables and charts are given rel. the air temperature, the depression of the wet-bulb thermometer of the sling psychrometer, and the barometric pressure, with the humidity in grains of water vapour per lb. of dry air. The A.S.T.M. specifications for knock characteristics of motor fuels designate min. and max. limits of humidity for the air

supplied to the engine. The depression of the wet-bulb thermometer corresp. to these limits are shown.

2317 533.275 : 551.571

Humidity measurements in presence of water-soluble salts. WILLIAMS, G. C., AND WILLIAMS, R. J. *Industr. Engng Chem.*, 35, *pp.* 730–732, *June*, 1943.—A theory is presented for the observed rise in wet-bulb temperatures when measured in atmospheres containing water-soluble salts, and a procedure is advanced for approximation of the true wet-bulb temperature from the observed value. Experimental data are presented on 4 water-soluble salts over a dry-bulb range of 60°C. and a corresponding wet-bulb range of 40°C.

See Abstr. 2355 533.73 : 536.633

SOUND. VIBRATIONS

2318 534.632

An application of the cathode-ray oscillograph to the measurement of the wavelength of sound. PATCHETT, G. N. *Proc. Phys. Soc., Lond.*, 55, *pp.* 324–325, *July*, 1943.—The phase difference between the input to a loud-speaker and the output of a microphone which can be displaced with respect to the loud-speaker is observed. The displacement necessary to change the phase difference by 1 cycle gives the wavelength, and the displacement is adjusted with the aid of a c.r.o.

OPTICS

2319 535.243.089.6

Wavelength calibration of spectrophotometers. AKKER, J. A. VAN DEN. *J. Opt. Soc. Amer.*, 33, *pp.* 257–259, *May*, 1943.—Describes a method for calibrating the wavelength scale of a spectrophotometer, using filters with linear spectral transmission curves over a small range of wavelengths, each covering one of the lines of the mercury spectrum to be used for the calibration. For each filter the wavelength setting of the instrument is found for which the measured transmission is equal to the known monochromatic transmission for the line. J. W. T. W.

See Abstr. 2362 535.3 : 537.531 : 621.386

See Abstr. 2349 535.312 : 536.3

See Abstr. 2363 535.312 : 548.73 : 537.531

2320 535.317 : 536.49

Thermal effects upon the performance of lens systems. PERRY, J. W. *Proc. Phys. Soc., Lond.*, 55, *pp.* 257–285, *July*, 1943.—The effects of heterogeneous temperature distribution and uniform temperature change are considered and the problems of eliminating heterogeneous disturbances are reviewed. The conditions (*a*) for arbitrary thermal correction and (*b*) for thermo-mechanical correction, by which variations of tube length and image position are mutually compensated, are considered. The results are applied to the generalized doublet having 1 air space and any number of components; and applications to photographic and astronomical objective-lens design are given.

See Abstr. 2447 535.323 : 548.33

2321 535.33.03

Plate-calibration problems. SAWYER, R. A., AND VINCENT, H. B. *J. Opt. Soc. Amer.*, 33, *pp.* 247–251, *May*, 1943.—A study of calibration procedures designed, primarily, to find a method satisfactory as regards self-consistency. Deficiencies of rotating-sector methods are indicated and it is concluded that the use of neutral filters is the most satisfactory method available. [See Abstr. 1928 (1943)]. A. H.

2322 535.338.4

The band spectrum of SnSe in emission. BARROW, R. F., AND VAGO, E. E. *Proc. Phys. Soc., Lond.*, 55, *pp.* 326–328, *July*, 1943.—The band spectrum [Abstr. 714 (1938)] has been excited in emission by a heavy-current uncondensed discharge through the vapour of Sn and Se. A well-developed system of red-degraded bands in the region 3 420–4 030 Å has been photographed and identified with the system *C*. The measurement of 20 new bands belonging to this system has led to a modification of the v'' assignment and of the ground-state vibrational terms.

2323 535.338.4

On the silicon oxide bands. WOODS, L. H. *Phys. Rev.*, 63, *pp.* 426–430, *June* 1 *and* 15, 1943.—Pankhurst [see Abstr. 2649 (1940)] has described a band spectrum believed to belong to SiO_2. A better excitation of the same bands has been obtained from a h.v. uncondensed discharge through a constriction in a quartz tube, but in He instead of H. These bands have been photographed on the 30 ft., 30 000 lines/in. grating spectrograph. The doublet structure and the *B* values prove that the emitter is SiO+.

2324 535.338.4

Note on spin doubling in the doublet sigma states of CO+. WOODS, L. H. *Phys. Rev.*, 63, *pp.* 431–432, *June* 1 *and* 15, 1943.—On the plates of the CO_2 spectrum [Abstr. 378 (1943)] were found pictures of the first neg. bands and the comet tail bands of CO+ in which the $^2\Sigma$ spin splittings were resolved. From the $^2\Sigma \rightarrow {}^2\Sigma$ transition, the abs. differences of the spin-doubling coefficients were measured. The abs. values of γ_0'' and γ_1'' for the lowest $^2\Sigma$ state were measured from the $^2\Pi \rightarrow {}^2\Sigma$ transition, and their algebraic signs determined by consideration of rel. intensities of branches. Thus the signs and values of the spin-doubling coefficients of $^2\Sigma'$ for $v' = 0$ to 4, and of $^2\Sigma''$ for $v'' = 0$ to 7, have been determined.

See Abstr. 2327 535.338.4 : 535.343

2325 535.338.42 : 535.375.5

Determination of chlorine vibrations in dichlorobenzenes from intensities and polarizations of their Raman lines. NORDHEIM, G., AND SPONER, H. *J. Chem. Phys.*, 11, *pp.* 253–262, *June*, 1943.—Intensities and polarization properties of vibrations in which mainly Cl atoms are participating, are investigated theoretically. It is assumed that the change of polarizability in these vibrations is connected primarily with displacements of the Cl atoms and that contributions from the individual atoms are additive. The Raman tensors belonging to the Cl vibrations are obtained by either adding or subtracting the single C–Cl contributions with ref. to a chosen system of axes rigidly connected with the molecule. The results are discussed in connection with existing exp. data.

2326 535.341

The continuous absorption of light in potassium vapour. DITCHBURN, R. W., TUNSTEAD, J., AND YATES, J. G. *Proc. Roy. Soc. A*, 181, *pp.* 386–399,

July 28, 1943.—A new type of absorption tube for the study of metal vapours is described. Measurements of the continuous absorption in K vapour, extending into the vacuum ultra-violet, are described. At short wave lengths the atomic absorption increases rapidly, and varies linearly with frequency. The results for the atomic absorption are in conflict with theory. It is suggested that exchange effects are operative.

See Abstr. 2364 535.341 : 537.531

2327 535.343 : 535.338.4

Visible absorption bands of mercury halides HgCl, HgBr and HgI. RAO, A. L. S. *Indian J. Phys.*, 16, *pp.* 393–397, *Dec.*, 1942.—The absorption bands of HgCl, HgBr and HgI were obtained by heating the substance in an open steel tube to a temperature of 1 100°C. In HgCl and HgBr the band systems were measured and a vibrational analysis is suggested. The heats of dissociation of these molecules in the upper and lower electronic states are determined.

2328 535.343 : 541.6

The infra-red absorption spectrum and configuration of cyclohexane. RASMUSSEN, R. S. *J. Chem. Phys.*, 11, *pp.* 249–252, *June*, 1943.—The number of bands found in the 700–1 350 cm.$^{-1}$ region confirms the chair structure (symmetry D_{3d}) as the most stable at room temperature. The band envelopes are discussed and compare well with the theory [Abstr. 1884 (1933)].

2329 535.371

Some applications of fluorescent chemicals. RADLEY, J. A. *J. Soc. Dy. Col., Bradford*, 59, *pp.* 137–140, *July*, 1943.

2330 535.375.5

The Raman effect. GLOCKLER, G. *Rev. Mod. Phys.*, 15, *pp.* 111–173, *April*, 1943.—A general survey of the theory and applications, covering more particularly the research from 1939–42, with over 500 references.

See Abstr. 2325 535.375.5 : 535.338.42

2331 535.43

The mathematics of turbid media. DUNTLEY, S. Q. *J. Opt. Soc. Amer.*, 33, *pp.* 252–275, *May*, 1943.—An entirely mathematical treatment of the problems met with in the passage of light through turbid media.

A. H.

2332 535.434 : 541.182.4

Transparent water-in-oil dispersions: the oleopathic hydro-micelle. HOAR, T. P., AND SCHULMAN, J. H. *Nature, Lond.*, 152, *pp.* 102–103, *July* 24, 1943.

2333 535.646

Metric for colour space. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 33, *pp.* 260–269, *May*, 1943.—Proposes a set of non-linear functional transformations of the familiar colour space so that it becomes a 3-dimensional space in which min. perceptible colour differences are represented by small spheres of the same size throughout. Geodesics are straight lines and planes of const. brightness in the C.I.E. space transform to planes in the transformed space. J. W. T. W.

2334 535.646

Metric based on the composite colour stimulus. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 33, *pp.* 270–277, *May*, 1943.—The metric described in the previous paper [see Abstr. 2333 (1943)] is based on the assumption of equality of just perceptible differences of colour, ignoring adaptation. For many practical purposes, however, the equality of large colour steps is the dominant consideration. The authors have developed a metric suitable for such conditions, based on the recent work done on the spacing of the Munsell colours. J. W. T. W.

2335 535.653.32

Colour index. DILLER, I. M., DEAN, J. C., GRAY, R. J. DE, AND WILSON, J. W., JR. *Industr. Engng Chem. (Analyt. Edit.)*, 15, *pp.* 367–373, *June* 15, 1943.—Describes a method for obtaining a colour designation for light-coloured petroleum products in terms of 2 parameters only. It is an extension of the system previously described for lubricating oils [Abstr. 148 (1943)]. J. W. T. W.

2336 535.733.1

Physiological theory of colour perception. GRANIT, R. *Nature, Lond.*, 151, *pp.* 11–14, *Jan.* 2; *Corresp., pp.* 213–215 *Feb.* 20; 632–635, *June* 5, *and pp.* 727–728, *June* 26, 1943.—As a result of a study of the electrical responses of retinal elements under stimulation by light, it appears that there is one type of element, termed the "dominator," which is responsible for the sensation of brightness and which has a spectral-sensitivity curve practically identical with that of the light-adapted eye. In addition there are "modulator" elements with spectral-sensitivity curves having their max. at various wavelengths, and it is suggested that these modulate the dominant impression so as to give the sensation of colour. J. W. T. W.

2337 535.733.1

Additional note on the trichromatic theory of colour vision. PEDDIE, W. *Phil. Mag.*, 34, *pp.* 426–430, *June*, 1943.—A supplementary note [Abstr. 149 (1943)], emphasizing the independence of the 3 activities in visual perception. Anomalous colour vision is explained by fusion of effects. Two laws are necessary and sufficient and the symbolic representation used should be independent of any supposed physiological or psychological process. J. W. T. W.

2338 535.733.1

Symposium on colour-blindness. *J. Opt. Soc. Amer.* 33, *pp.* 293–334, *June*, 1943.—A symposium of papers, with the following titles: Facts of colour-blindness,, Judd, D. B. [Abstr. 2343 (1943)]; Methodology in test preparation, Dimmick, F. L. [Abstr. 2339 (1943)]; Evolution of colour vision tests, Murray, E. [Abstr. 2340 (1943)].

2339 535.733.1

Methodology in test preparation. DIMMICK, F. L. *J. Opt. Soc. Amer.*, 33, *pp.* 308–315, *June*, 1943.—After a discussion of the psychological considerations which enter into the testing of colour vision, the author states a series of requirements which should be fulfilled in such testing if the results are to give reliable information. These include size and position of test specimens, order of presentation, adaptation level, number and type of judgments called for, form of instructions given and effect of practice. J. W. T. W.

2340 535.733.1

Evolution of colour-vision tests. MURRAY, E. *J. Opt. Soc. Amer.*, 33, *pp.* 316–334, *June*, 1943.—A

history of testing for defects of colour vision, followed by a classification and a critical examination of the tests in common use. The desiderata of any test are set out, as well as the need for adapting tests to the requirements of special vocations. The testing of school children is advocated. There is an extensive bibliography. J. W. T. W.

2341 535.733.1-1

Visual observations in the infra-red. PRESTON, J. M. *J. Soc. Dy. Col., Bradford*, 59, *pp.* 141–143, *July*, 1943.—With a filter transmitting no radiation of wavelength shorter than 720 mμ (the filter may be used either over the illuminant or in light-tight spectacles worn by the observer) it is possible to carry out rapidly certain operations, e.g. to distinguish dyes which are visually the same, to find dyes which have a required absorption or lack of absorption in the infra-red, to locate foreign matter under visually dark colours which become transparent in the infra-red.

J. W. T. W.

2342 535.736

The limit of visual resolution. SELWYN, E. W. H. *Proc. Phys. Soc., Lond.*, 55, *pp.* 286–291, *July*, 1943.—The diffraction image of a long line source of light at the focus of a lens with a circular aperture is calculated. The figures are used to find what intensity drop betw. 2 bright lines is at the threshold of visibility, by making observations on the separation of 2 line sources at which a dark line is visible betw. their images. On the average, a 3% drop of intensity is required.

2343 535.755

Facts of colour blindness. JUDD, D. B. *J. Opt. Soc. Amer.*, 33, *pp.* 294–307, *June*, 1943.—After a brief history of the study of colour blindness, the author sets out a comprehensive classification on the basis of the various classifications proposed by different workers. He then treats of the causes of colour blindness, congenital and acquired, and points out that the normal observer only possesses truly normal colour vision under a very limited range of conditions. The characteristics of red-green blind and red-green weak observers are described, and it is shown that it may be possible to predict precisely the appearance of colours to red-green blind observers. The paper contains an extensive bibliography. J. W. T. W.

HEAT. THERMODYNAMICS

2344 536.21

A steady-state problem in heat conduction. LOWAN, A. N. *Phil. Mag.*, 34, *pp.* 502–504, *July*, 1943.—Considers the temperature distribution in a semi-infinite cylindrical annulus, bounded by the plane $z = 0$ and the surfaces $r = a$ and $r = b$; $z = 0$ and $r = a$ are kept at 0°C., and $r = b$ at $T = f(z)$.

2345 536.21 : 628.81

The warming of walls. DUFTON, A. F. *Phil. Mag.*, 34, *pp.* 376–377, *June*, 1943.—A homogeneous wall, initially at uniform temperature, is considered. Heat is supplied to one surface at a const. rate and the temperature of the second face of the wall is assumed const. [See Abstr. 3519 (1931)].

2346 536.212.3 : 518.3

Thermal-conductivity nomographs for wood. DAVIS, D. S. *Industr. Engng Chem.*, 35, *p.* 673, *June*, 1943.

2347 536.23 : 536.658

The accommodation coefficients of He, Ne, A, H_2, D_2, O_2, CO_2, and Hg on platinum as a function of temperature. THOMAS, L. B., AND OLMER, F. *J. Amer. Chem. Soc.*, 65, *pp.* 1036–1043, *June*, 1943.—The temperature distributions over an electrically heated filament in vacuum and in gas are discussed. A tube designed to give uniform temperature is described and accommodation coefficients for 8 gases obtained with this tube are reported and compared with existing values.

2348 536.23 : 621.317.39

Controlled-atmosphere indicator. HANSEN, C. A., JR. *Gen. Elect. Rev.*, 46, *pp.* 221–222, *April*, 1943.—[Abstr. 1858 B (1943)].

2349 536.3 : 535.312

Reflection as a factor in heating. FIELDEN, M. *Engineer, Lond.*, 175, *pp.* 486–487, *June* 18, 1943.—A general account of the reflection and absorption of heat energy at various surfaces. Attention is directed to the use of sheet metal, metallized wall papers and bronze paints as a means of ensuring that infra-red radiation is well reflected from the walls. This provides an increased sense of comfort. R. W. P.

See Abstr. 2450 536.413 : 548.73

2350 536.413.2

Thermal expansivity and density of indium. HIDNERT, P., AND BLAIR, M. G. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 427–433, *June*, 1943.

2351 536.42 : 541.66

The melting-points and unit-cell dimensions of the symmetrical halogen-benzenes. BEACALL, T. *Trans. Faraday Soc.*, 39, *pp.* 214–216, *July–Aug.*, 1943.—In the symmetrically substituted halogen benzenes, the replacement by Br of 1, 2 and 3 pairs of Cl atoms in *para*-position produces similar effects upon the m.p. and the dimensions of the unit cells. *p*-dichlorobenzene exhibits an abnormally low m.p. and abnormally high unit-cell dimensions. Similar effects are exhibited by the *p*-dihalogen nitrobenzenes.

2352 536.468 : 679.5

Ignition points of plastic materials. DELMONTE, J., AND AZAM, M. A. *Mod. Plast.*, 20, *pp.* 88, 122 *and* 124, *Feb.*, 1943.—Comparative burning-rates of plastic materials are determined for thin foils and thick sections; in tests, the importance of controlling technique of igniting plastic materials to determine whether it would support combustion once it has burst into flames is emphasized; "fusee" strip for igniting thin foils from a burning piece of cellulose nitrate proved acceptable; igniting plastic material with the Bunsen burner was used for thicker specimens.

E. R. A.

See Abstr. 2320 536.49 : 535.317

2353 536.52 : 669.18 : 621.317.39.082.62

The measurement and control of liquid-steel temperatures. LAND, T. *J. Soc. Glass. Technol.*, 27, *pp.* 22–31 (*T*), *Feb.*, 1943.—[Abstr. 2077 B (1943)].

2354 536.587 : 621.316.74.076.7

Experimental details for a precision high-temperature control using the Hull circuit. WARING, C. E., AND ROBISON, G. *Rev. Sci. Instrum.*, 14, *pp.* 143–146, *May*, 1943.—[Abstr. 2056 B (1943)].

2355 536.633 : 533.73

Heat capacities of hydrocarbon gases. STULL, D. R., AND MAYFIELD, F. D. *Industr. Engng Chem.*, 35, *pp.* 639–645, *June*, 1943.—The method of calculation [Abstr. 464 (1942)] is extended to a wider temperature range, and to acetylene derivatives. A table of solutions to the Einstein function for one degree of freedom is included. A table of bonding-frequency contributions to the molar heat capacity for temperatures from 250° to 1500°K. is presented.

See Abstr. 2347 536.658 : 536.23

ELECTRICITY. MAGNETISM

2356 537 : 581

Electrical correlates of pure and hybrid strains of sweet corn. BURR, H. S. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 163–166, *June*, 1943.—Electrical correlates have been found betw. different inbred strains of sweet corn even when the difference is due only to a single gene. The magnitude of the p.d. is positively correlated with the degree of hybrid vigour.

2357 537.226.2 : 621.315.614.7

Dielectric properties of animal fibres. ERRERA, J., AND SACK, H. S. *Industr. Engng Chem.*, 35, *pp.* 712–716, *June*, 1943.—At 120 kc./s.–13 Mc./s. the permittivity of wool and mohair fibres and human hair is 4·2. The difference betw. this value and the (refr. index)^2 is due to atomic or ionic polarization. A weak dispersion zone exists in the region below 120 kc./s. The stretching of the fibres has no effect on the permittivity. Silk behaves exactly as wool. Nylon has a lower permittivity, and the dispersion zone reaches into the h.f. region.

2358 537.311.3 : 621.315.614.7

Electrical conduction of textiles. BAXTER, S. *Trans. Faraday Soc.*, 39, *pp.* 207–214, *July–Aug.*, 1943.—Experimental results on the electrical properties of textile fibres with and without adsorbed water are given. The temp. coeff. of the electrical conductivity of wool at const. regain is independent of regain for values $> 5\%$. For wool fibres below 5% regain, polarization is shown, but this disappears for higher regains and Ohm's law is obeyed. The conductivity of wool with adsorbed methyl alcohol, and for glass fibres with adsorbed water vapour, is similar to the wool-water system. The theory that the conduction of textile fibres is due to the conductivity of water condensed in the inter-micellar channels does not fit the exp. data and a new theory is put forward on the assumption that dry wool is an almost perfect insulator, and that adsorbed water molecules cause impurity centres giving rise to electronic conduction.

2359 537.311.33

Semi-conducting properties of stannous sulphide. CLARK, M. C., AND ANDERSON, J. S. *Nature, Lond.*, 152, *pp.* 75–76, *July* 17, 1943.

2360 537.312.6 : 539.234

Electrical conduction and recrystallization in thin Pb films deposited at low temperatures. ARMI, E. L. *Phys. Rev.*, 63, *pp.* 451–454, *June* 1 *and* 15, 1943.—By evaporation in high vacuum, thin Pb films were deposited on glass plates cooled by liquid H. Beginning of electrical conduction was observed in films of a nominal thickness of 7 Å. Ageing of these films at various temperatures revealed the existence of 2 regions of different behaviour; decrease of resistance below and increase of resistance above an equilibrium temperature.

2361 537.363 : 541.182

Electrophoresis of colloids under wartime conditions. STERN, K. G. *Rev. Sci. Instrum.*, 14, *p.* 187, *June*, 1943.—[See Abstr. 1900 (1937)].

2362 537.531 : 535.3 : 621.386

Some physical measurements with a 500 kV continuously evacuated X-ray tube. MEREDITH, W. J., AND STEPHENSON, S. K. *Brit. J. Radiol.*, 16, *pp.* 239–241, *Aug.*, 1943.—[Abstr. 2121 B (1943)].

2363 537.531 : 535.312 : 548.73

The reflection of X-rays from the "anti-phase nuclei" of $AuCu_3$. WILSON, A. J. C. *Proc. Roy. Soc. A*, 181, *pp.* 360–368, *July* 28, 1943.—The superlattice lines in X-ray photographs of $AuCu_3$ are not always as sharp as the main lines, and the broadening depends markedly on the indices of the line [Abstr. 2672 (1938)]. It is assumed that the crystals of $AuCu_3$ contain many "anti-phase nuclei" in which the superlattice is organized in different ways. The integral breadth of a reflection from a crystal in which all the unit cells are not the same is $\lambda J_0/\cos\theta \int J_t dt$, where J_t is the mean value of the product FF^* of the structure factors of two unit cells separated a distance t in the hkl direction.

2364 537.531 : 535.341

Measurements on X-ray production and absorption in the range 0·7 to 2·5 MV. PETRAUSKAS, A. A., ATTA, L. C. VAN, AND MYERS, F. E. *Phys. Rev.*, 63, *pp.* 389–399, *June* 1 *and* 15, 1943.—From 0·7–2·5 MV, the intensity and the total mass absorption coeff. of the heterogeneous radiation produced in a thick Au target have been measured as a function of tube voltage, angle with resp. to the electron beam, and thickness and material of the filter. Curves giving the dependence of absorption coeff. on voltage are presented for Pb, Sn, Cu, Al, C and H_2O. A method is described for calculating the absorption coeff. of the heterogeneous radiation produced at a given tube voltage and subjected to a given amount of filtration, utilizing accepted values for the absorption coeff. of homogeneous radiation. A method for calculating the efficiency of X-ray production from these data is described and used to obtain results in agreement with theory in the range 0·90–2·35 MV. [See Abstr. 2644 (1939)].

2365 537.568

The retardation and neutralization of argon ions in helium. HAMM, W. J. *Phys. Rev.*, 63, *pp.* 433–438, *June* 1 *and* 15, 1943.—An apparatus is described for making direct measurements of the loss of forward velocity of A ions in single encounters with He atoms. Results are given in the form of collision cross-sections for given percentage retardations. The cross-sections are zero for energy losses $> 33{\cdot}1\%$ and increase with decreasing percentage loss and decreasing beam speed. A correction to the readings is itself the cross-section for charge exchange betw. the A ions and the He atoms.

2366 537.591.1

Penetrating non-ionizing cosmic rays. JÁNOSSY, L., AND ROCHESTER, G. D. *Proc. Roy. Soc. A*, 181,

pp. 399–408, *July* 28, 1943.—An account is given of experiments proving the existence of a penetrating non-ionizing component of cosmic radiation at sea-level. The radiation has a mean range of approx. 10 cm. in Pb, and is probably the same as the radiation discovered [Abstr. 1009 (1941)] at 4 300 m. The radiation might consist of neutrons.

2367 538.21 : 621.318.322

A comparison of the magnetic properties of solid and powdered magnetites: with observations on coercive force. HERROUN, E. F. *Proc. Phys. Soc., Lond.*, 55, *pp.* 338–343, *July*, 1943.—[Abstr. 2087 B (1943)].

2368 538.222

Magnetic properties of solid solutions. III. The paramagnetic alloys of copper and nickel. KAUFMANN, A. R., AND STARR, C. *Phys. Rev.*, 63, *pp.* 445–450, *June* 1 *and* 15, 1943.—[See Abstr. 2188 (1941)]. The magnetization of Cu-Ni was studied as a function of temperature and applied field. A Curie–Weiss equation cannot represent the results; an equation of the form $\chi = aT + b + (c/T)$ is satisfactory. Alloys in the range from 30–38% Ni showed a considerable field dependence of the susceptibility at low temperatures.

2369 538.224 : 541.67

Magnetochemical investigations. I. Introduction and experimental technique. II. The diamagnetic susceptibility of the $> CH_2$ group. III. The diamagnetic susceptibility of isomerides. ANGUS, W. R., AND HILL, W. K. *Trans. Faraday Soc.*, 39, *pp.* 185–201, *July–Aug.*, 1943.—A modified Gouy method for measuring magnetic susceptibilities is described. The electromagnet gives a field of 6 600 gauss at 1·2 A for a pole-piece gap of 1 cm.—The diamagnetic susceptibilities of 39 highly purified liquids were measured. The compounds are members of homologous series, and anaiyses of the data by the Pascal subtraction method and by the graphical method of Farquharson and Sastri yield values of $-11{\cdot}68 \pm 0{\cdot}02$ and $-11{\cdot}69 \pm 0{\cdot}003$, respectively, for the diamagnetic increment of the $> CH_2$ group. The latter method is considered the more accurate. Conversion of an acid into its methyl ester yields a value of $-10{\cdot}66$ for χ_{CH_2}. An *iso*-compound is more diamagnetic than its *n*-isomeride.—The diamagnetic susceptibility of an isomeride with a branched hydrocarbon chain is $>$ that of the corresp. straight chain compound, and the sequence appears to be *tert.*- slightly $>$ *sec.*- $>$ *iso*- $>$ *n*-. For *n*- and *iso*-isomerides the more diamagnetic compound has the lower values for b.p., density and refr. index. The *iso*-compound is approx. 1 unit more diamagnetic than the *n*-isomeride. Monocarboxylic acids are more diamagnetic (by approx. 1 unit) than isomeric esters. Evidence is adduced to show that the more diamagnetic isomeride has the smaller mol. vol.

2370 538.24

Investigations of ferromagnetic impurities. II. CONSTANT, F. W., FAIRES, R. E., AND LENANDER, H. E. *Phys. Rev.*, 63, *pp.* 441–444, *June* 1 *and* 15, 1943.—[See Abstr. 4156 (1939)]. An attempt was made to render impurities non-magnetic through heat treatment. In the case of Cu and brass, heating to 900°C. and 750°C., respectively, in H for 2 hr. or more, followed by quenching, eliminates ferromagnetism. This method was not successful with Ag. In the case of Cu, reheating to 900°C. in an atmosphere containing O caused the ferromagnetism to return strongly.

2371 538.248 : 621.314.224 : 621.316.925

Effect of current-transformer residual magnetism on balanced-current or differential relays. SEELEY, H. T. *Trans. Amer. Inst. Elect. Engrs*, 62, *pp.* 164–168, *April*, 1943.—[Abstr. 2059 B (1943)].

2372 538.56 = 3

The making visible and photographing of the field of Hertzian waves. [Method of "Spark Stycto-graphy"]. ARKADIEW, W. K., AND PENNER, D. I. *C.R. (Doklady) Acad. Sci. U.R.S.S.*, 28, *pp.* 315–317, *Aug.* 10, 1940. *Abstr. in Wireless Engr*, 20, *p.* 345, *July*, 1943.—The method employs a thin layer of metallic particles scattered on a photographic plate or paper which is kept vibrating with sufficient intensity to make the particles vary in their spacing so that the optimum distances for spark formation (under the influence of the u.s.w. field) occur.

2373 538.566 : 621.396.11 = 3

The electric fundamental wave of the circular cylindrical double-layer cavity. BORGNIS, F. *Hochfrequenztechn. u. Elektroakust.*, 59, *pp.* 22–26, *Jan.*, 1942.—To measure the permittivity by means of cavity resonators [Abstr. 343 B (1940)] the electric and magnetic field distribution in a double-layer cavity filled with 2 concentric media of different permittivity must be determined. The general solution is derived and the resonance wavelength is given as a function of the ratio of the radii of the inner dielectric and the cavity, and of the ratio of the 2 permittivities. The field distribution is compared with that of a homogeneous cavity. The change in characteristic frequency for very small values of the ratio of the radii is determined and it is shown that the same relations are found from energy considerations. R. N.

2374 538.566 : 621.396.11 = 3

The magnetic fundamental oscillation of the cylindrical cavity with circular cross-section. BORGNIS, F. *Hochfrequenztechn. u. Elektroakust.*, 60, *pp.* 151–155, *Dec.*, 1942. *Abstr. in Wireless Engr*, 20, *pp.* 344–345, *July*, 1943.—The expressions for the elect. and magn. components of the magnetic fundamental oscillation [Abstr. 343 B (1940)] are taken as starting-point. The natural wavelength of an inf. long cylinder is $\lambda = 3{\cdot}41R$; R must be $> \lambda/3{\cdot}41 = 0{\cdot}293\lambda$. With decreasing l and const. R the natural wavelength decreases, but never falls below $\lambda/2$: for $l = \lambda/2$ the equation gives $R = \infty$. The conditions for equality of the resonance wavelengths of the elect. and magn. fundamental oscillations are discussed.

2375 538.566.3 : 621.396.11

Measurement of the angle of arrival of downcoming waves from Indian regional short-wave stations. RAO, M. R. *Indian J. Phys.*, 16, *pp.* 347–367, *Dec.*, 1942.—[Abstr. 2128 B (1943)].

2376 538.566.3 : 621.396.11 = 3

Reciprocity of wave propagation through magnetically doubly-refracting media. GOUBAU, G. *Hochfrequenztechn. u. Elektroakust.*, 60, *pp.* 155–160, *Dec.*, 1942. *Abstr. in Wireless Engr*, 20, *p.* 352, *July*, 1943.—[Abstr. 2131 B (1943)].

2377 538.614 : 541.653

Magnetic-optic rotation. IV. Acetic and chloro-acetic acids in polar and non-polar solvents. V. Selenium oxychloride in aqueous solutions. WARING, C. E., STEINGISER, S., AND HYMAN, H. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1066–1070, *June*, 1943.—The mole % density, Verdet const., mol. Verdet const., refr. index and mol. refractivity were determined and tabulated for each aq. solution. Curves were plotted for the mole % against the mol. Verdet const. For $SeOCl_2$, a discontinuity was noted at 33·3 mole % corresponding to the solvate $SeOCl_2 . 2H_2O$ with accompanying alteration in the internal bond configuration. Straight-line graphs were obtained for the other substances owing to the absence of change in the intramolecular electronic configuration. The association and other dipole effect exhibited by the acetic acid does not alter this structure.

MOLECULAR AND ATOMIC PHYSICS

2378 539.13

Structure of the electronic bands of the OD molecule. VI. Isotopic shift. SASTRY, M. G. *Indian J. Phys.*, 16, *pp.* 343–346, *Dec.*, 1942.—[See Abstr. 410 (1943)]. From the constants of the OH molecule, the vibrational and rotational isotope shift in the OH and OD band heads are calculated. When compared with observed shifts large discrepancies are found. No electronic shift could be postulated and, if it exists, it is < a unit of wave number.

2379 539.132

Interaction of the van der Waals type between three atoms. AXILROD, B. M., AND TELLER, E. *J. Chem. Phys.*, 11, *pp.* 299–300, *June*, 1943.

2380 539.132

Molecular wave functions for lithium. COULSON, C. A., AND DUNCANSON, W. E. *Proc. Roy. Soc. A*, 181, *pp.* 378–386, *July* 28, 1943.—The method of molecular orbitals is applied to a discussion of the ground state of Li_2. Both the simple product-type functions and the determinantal functions are used. The changes in screening-constants in passing from atomic to molecular states is discussed. Provided that all the molecular orbitals used are mutually orthogonal, there is not as much electron exchange betw. inner and valence electrons as has been supposed.

2381 539.133

Dipole moment and molecular structure. V. Dipole moments of derivatives of ethylene glycol and of glycerides. GOKHALE, S. D., PHALNIKAR, N. L., AND BHAWE, S. D. *J. Univ. Bombay*, 11, *pp.* 56–62, *March*, 1943.—The dipole moments of ethylene glycol monomethyl and monoethyl ethers, mono- and di-acetates, di-myristate, and di-stearate, methoxy- and ethoxy-ethanol acetates and stearates, methoxy ethanol myristate, monostearin, monomyristin, and diethyl succinate, have been determined. Replacement of a H of the OH group by CH_3 lowers the dipole moment. C_2H_5 has a similar, but smaller, effect. Increase in the length of chain in carboxylic acids has little effect on dipole moment. Differences betw. the moments of acetates and stearates are small, and the structures of these compounds should be analogous.

A. J. M.

2382 539.133 : 532.771

Dipole moments of palmitic acid, aleuritic acid and alkyl esters of aleuritic acid. BHATTACHARYA, G. N. *Indian J. Phys.*, 16, *pp.* 369–376, *Dec.*, 1942.—Dipole moments of palmitic acid, aleuritic acid (9, 10, 16 trihydroxypalmitic acid) and methyl and ethyl esters of aleuritic acid were determined from their dilute solutions in 1, 4 dioxane, at 25°C. for all but aleuritic acid for which the temp. 40°C. was used. The cause of anomalous solubility of aleuritic acid or its esters in polar solvents or when some polar helper is added to the solvent is discussed.

2383 539.152.1

The antisymmetrical interaction in beta-decay theory. CRITCHFIELD, C. L. *Phys. Rev.*, 63, *pp.* 417–425, *June* 1 *and* 15, 1943.—Forms of the β-decay interaction are sought which are totally symmetric and totally antisymmetric to the interchange of any 2 of the particles involved in the emission. There is no symmetric interaction and 1 antisymmetric. The antisymmetric interaction allows transitions without change of parity and with a change of nuclear spin of either 0 or $\pm$ 1, including $0 \rightarrow 0$. The contributions of electron-neutrino states of definite angular momenta are presented explicitly. The influence of the Coulomb field is discussed.

2384 539.163 : 550.422

Causes of variations in radio-activity data. KEEVIL, N. B., KEEVIL, A. R., INGHAM, W. N., AND CROMBIE, G. P. *Amer. J. Sci.*, 241, *pp.* 345–365, *June*, 1943.—Variations by a factor of 50 or more are found in the radioactive content from specimen to specimen. The greatest differences occur in granitic rocks, the least in sedimentary sections. Radioactive elements are more concentrated near the border than at the core of the Bourlamaque batholith.

2385 539.163.4

Dual decay of potassium. THOMPSON, F. C., AND ROWLANDS, S. *Nature, Lond.*, 152, *p.* 103, *July* 24, 1943.

2386 539.164.08 : 539.185.08 : 778.31

Applications of the photographic method to problems in nuclear physics. I. (a) The determination of the energy of homogeneous groups of α-particles and protons. (b) The determination of the energy of fast neutrons. POWELL, C. F. *Proc. Roy. Soc. A*, 181, *pp.* 344–359, *July* 28, 1943.—The particles studied are (*a*) α-particles from Th and U; (*b*) protons from the disintegration of B and Li by 500 ekV deuterons, and (*c*) neutrons from the deuteron bombardment of D, Be, B and Fl. The experimental width at $\frac{1}{2}$ max. of a homogeneous group of particles is nearly independent of the energy in the range from 1 to 13 eMV, and is = 0·3 eMV for protons and 0·5 eMV for α-particles. [See Abstr. 897 (1943)].

See Abstr. 2386 539.185.08 : 778.31 : 539.164.08

2387 539.211

Surface finishes. MIKELSON, W. *Gen. Elect. Rev.*, 46, *pp.* 185–188, *March*, 1943.—The G.E.C. system of specifying surface finishes consists of reference to a set of sample specimens, which are, in many respects, similar to those adopted by the U.S. Army Ordnance Dept. The symbol used is an "f" with an attached

index number running from 1–10. There are 10 degrees of roughness, varying in 2-to-1 steps from 4 to 2 000 μin. (r.m.s. value). Each symbol may apply to one or more sample finishes, but all are machined to the same roughness on a metal specimen block, to illustrate differences in surface characteristics encountered in practice. For example, in the case of "f^1," the same roughness may be obtained by lapping or honing, thus two samples are included in the set. The use of the system in machine drawings is illustrated by examples. A. C. W.

2388 539.213 : 539.501 : 666.1/.2

Anomalous flow in glasses. TAYLOR, N. W. *J. Phys. Chem.*, 47, *pp.* 235–253, *March*, 1943.—The dissociated character of glasses at high temperature tends to be preserved on quick cooling, owing to the high viscosities, but as association proceeds the glass finally becomes stabilized. Such a glass shows a viscosity which at const. temperature is const. The rate of association follows a bimolecular reaction law. When stabilized glass is subjected to a const. stress, the elongation is a summation of elastic adjustment and viscous flow. The former is itself complex, being a combination of several relaxation processes of different rates, each obeying the Maxwell law. Numerical data are given for soda-silica and potash-silica glasses. Superposition of independent relaxation processes of different characteristic rates and of opposite sign gives rise to anomalous reversals. Examples of such phenomena in the discharge current of capacitors and in the ageing of thermometers are described. A molecular picture of a glass is presented.

2389 539.214 : 627.4

An introduction to soil mechanics. LOWE-BROWN, W. L. *Engineer, Lond.*, 175, *pp.* 104–106, *Feb.* 5; 124–126, *Feb.* 12, *and pp.* 144–146, *Feb.* 19, 1943.—The subject of the mechanical properties of sandy and clay soils, and the manner in which these properties condition the use of the soils as constructional materials are simply, clearly and interestingly reviewed without ref. to abstruse mathematical theory. The subjects discussed include: internal friction and cohesion, stability of earth slopes, retaining walls, compression and consolidation of cohesive material, Terzaghi's researches, liquidity indices, compressive curves, consolidation, testing procedure, consolidation curves, foundations and settlements, pile and loading tests, dams and weirs on permeable foundations, and factors of safety. An adequate bibliography of 25 refs. is given. J. S. G. T.

2390 539.215.4 : 519.21

A theory of the size distribution of particles in a comminuted system. GRIFFITH, L. *Canad. J. Res. A*, 21, *pp.* 57–64, *June*, 1943.—It is shown that the problem of the size distribution of particles in a system that has been ground can be treated by the general methods of the theory of probability. The mathematical procedure is identical with that used in statistical mechanics of gases, although the fundamental ideas are different, as the molecules of a solid are not free to move. The distribution laws agree with empirical laws for particles of sizes down to 1 μ, but proof of the theory will depend upon study of size distributions in colloidal systems.

2391 539.215.4 : 77

Estimation of print graininess from measurements on the negative material. SELWYN, E. W. H. *Phot. J.*, 83, *pp.* 227–234, *June*, 1943.—Granularity and graininess are discussed at length and it is proposed that the graininess of negative material be specified (for pictorial purposes) as the quotient of the granularity by the slope of the characteristic curve one log exposure unit above Jones' speed point. The suitability of this measurement has been checked by direct experimental tests on prints. A. H.

2392 539.234

Studies on the structure of thin metallic films by means of the electron microscope. PICARD, R. G., AND DUFFENDACK, O. S. *J. Appl. Phys.*, 14, *pp.* 291–305, *June*, 1943.—A study was made of thin films of Al, Cd, Cu, Au, Mg and Zn using an RCA electron microscope capable of 30 A resolving power. The films were formed by evaporation and condensation on collodion substrates in vacuum. An evaporating chamber was devised that permitted control of the temperature of the condensing surface. Photographs of the surfaces show that all the films are made of agglomerates of the metals separated by interstices of various widths. All evidence leads to the conclusion that the surface structure is explainable by assuming migration of the atoms over the surface. The observed structure can be used to explain the electrical conductivity, the optical reflectivity, and adsorptivity of thin films. Electron microscopic studies also provide a ready means of classifying surfaces according to the mobility of the atoms comprising them, and thus enable a rough estimate of the potential distribution over the surface to be made.

See Abstr. 2360 539.234 : 537.312.6

2393 539.26 : 620.15

A tension-compression device for quantitative X-ray diffraction evaluation of strain in metals and a calibrated series of aluminium alloys. CLARK, G. L., PISH, G., AND SEABURY, R. *J. Appl. Phys.*, 14, *pp.* 284–290, *June*, 1943.—[Abstr. 1994 B (1943)].

ELASTICITY. STRENGTH

2394 539.319 : 621.791 : 621.367

Welding contraction and "locked-up" stresses. *Engineer, Lond.*, 175, *pp.* 423–425, *May* 28, 1943.—[Abstr. 1896 B (1943)].

2395 539.319.087.5 : 621.385.8

Recording unit for strain and timing functions. MEIER, J. H. *Electronics*, 16, *pp.* 79–83, *April*, 1943.—[Abstr. 2120 B (1943)].

2396 539.378.3

Diffusion rates of carbon in iron-molybdenum and iron-tungsten alloys. SMOLUCHOWSKI, R. *Phys. Rev.*, 63, *pp.* 438–440, *June* 1 *and* 15, 1943.—Measurements are reported of the influence of W and Mo on the diffusion rate of C in face-centred Fe at 1 000°C. Both elements slow down the diffusion of C. These results are compared with previous measurements on Fe-Co alloys [Abstr. 908 (1943)].

2397 539.388.8 : 674.04

The importance of moisture content. *Brit. Plast. Mould. Prod. Tr.*, *pp.* 30–36, *June*, 1943.—The relation betw. swelling and moisture content is discussed and

e rate of swelling considered. The increase of oisture content due to glueing is studied and a rough mpirical formula for the increase presented. Further mplifications are made for casein, Aerolite K, Aero- e FF and Aerolite Foam, in order to draw a com- arison betw. their respective spreads and the resulting crease in moisture content of the wood. M.-V.

2398 [539.4.013/.019 : 679.5

Structure and breaking strength of plastic mouldings. *lastics, pp.* 251–257, *June*, 1943.—Concerns the in- uence of shapes and moulding control on the strength f test pieces. The effect of varying the time of osing of the die upon the flow of the moulding owder in the die cavity is illustrated, and discussed ith ref. to moisture content. The grain size of the oulding powder is important and the results of con- olling this factor are analysed. M.-V.

2399 539.4.013 : 666

The effect of shape on the thermal endurance of glass ods. MURGATROYD, J. B. *J. Soc. Glass Technol.*, 27, *p.* 5–17(*T*), *Feb.*, 1943.—An examination of published xperimental work on the thermal endurances of glass ods makes it possible to deduce a general relationship etw. thermal endurance and radius. The expression derived from the results of tests on borosilicate and n soda-lime-silica glasses, and on others of coeff. f expansion intermediate betw. these. The results re used to prepare a table of rel. max. stresses de- eloped in rods of different radius subjected to the ame thermal shock.

2400 539.4.016 : 621.774

The design of cold-stretched thick-walled cylinders nd tubes for very high pressures. WINTSCH, H. VON. *chweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 81–95, *March*, 1943.—[Abstr. 1951 B (1943)].

2401 539.4.016 : 679.56

Effects of continued heating on mechanical properties f moulded phenolic plastics. CARSWELL, T. S., ELFAIR, D., AND HASLANGER, R. U. *Trans. Amer. oc. Mech. Engrs*, 65, *pp.* 325–328, *May*, 1943.—Abstr. 2152 B (1943)].

2402 539.4.019.1 : 620.15

Some tensile-shock properties of carbon steels. ARNOCK, F. V., AND BRENNAN, J. B. *J. Iron Steel nst.*, [20 *pp.*], *July*, 1943. *Advance copy.*—[Abstr. 995 B (1943)].

2403 539.431 : 621.8

Fatigue failures in common machine parts. ALMEN, J. O. *Metal Progr., pp.* 737–740, *May*, 1943.—The atigue vulnerability of bolts and studs is discussed ith ref. to insufficient bolt tightness and details are iven of tests carried out on ordinary and pre-stressed olts. Elasticity in gear trains is studied. Gear oth failures are generally due to mechanical faults. itting of gear teeth is due to a form of fatigue in- uced by compression loads on the contacting tooth urfaces and the high surface pressures that can be ormed by gears running completely immersed in oil. M.-V.

2404 539.431 : 674.049

Behaviour of plywood under repeated stresses. DIETZ, A. G. H., AND GRINSFELDER, H. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 187–191, *April*, 1943.—Fatigue tests were made on plywood specimens constructed of aircraft-quality birch veneer (1/16 in. thick) bonded with 2 types of adhesive: (1) a thermo-setting phenol-formaldehyde film (Tego) and (2) an aq. solution of cold-setting urea-formaldehyde (Uformite CB 551). Cantilever-type testing machines were employed, using electric motors running at 1 750 r.p.m. The test results show that the fatigue failures were primarily wood failures, delamination of the veneers occurred very seldom before the outer plies had given way, and the material will probably withstand 2 million stress cycles without failure when stressed to 25% or less of the static modulus of rupture. A. C. W.

2405 539.434 : 669.14 : 620.16

Effect of de-oxidation practice on creep strength of carbon-molybdenum steel at 850° and 1 000°F. MILLER, R. F. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 309–316, *May*, 1943.—[Abstr. 1996 B (1943)].

2406 539.501

The processes of elastic and plastic deformations. FREY, K. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 98–100, *March*, 1943.—A diagram is given showing the various types of shear-angle/time, shear-angle/shear-stress, and flow-velocity/shear-stress curves obtained in testing elastic and plastic materials. Elastic materials are subdivided into ideal and other materials, while plastic materials are subdivided into plastic and viscous groups. [See *Nature, Lond.*, 149, p. 702, June 20, 1942]. A. C. W.

See Abstr. 2388 539.501 : 666.1/.2 : 539.213

2407 539.62 : 532.516 : 621.89

Static friction. CLAYPOOLE, W. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 317–324, *May*, 1943.—A new machine is described by means of which static friction betw. contacting surfaces separated by lubricating films of thickness approaching molecular dimensions can be measured with considerable precision. In a test run, a number of spot determinations of the static coeff. are made at closely spaced points over a short rubbing track not exceeding a few thousandths of an inch in length. The individual slips at the contact may be as small as 0·0002 in. A significant correlation betw. static friction and the mol. structure and dimensions of a pure hydrocarbon lubricant has been established. Exceedingly smooth contacting surfaces overlaid with monomolecular films of strongly polar hydrocarbons have exhibited the phenomenon of vanishingly low static friction.

2408 539.621

Contribution to research into the process of frictional wear. MAILÄNDER, R. VON, AND DIES, K. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 95–98, *March*, 1943.—In tests in which a Cr-steel disc was rubbed upon a soft-iron surface, the load on the disc and the velocity of rubbing being varied, it was found that friction first decreased with increase of load and then increased, while the amount of material removed increased first of all and then decreased. Change of the soft-iron specimen gave a narrow band of results. The peak of the removed-material load curve increased with decrease of sliding velocity, and also increased with increase of the atm. humidity. The type of

atmosphere surrounding the specimen also had an effect on this peak, max. value being obtained with air, oxygen next, then N_2, H_2, and finally a partial vacuum. The max. value of the amount of material removed decreased with increase of the C content in the case of C-steels, and heat treatment affected the results. A. C. W.

PHYSICAL CHEMISTRY

See Abstr. 2287 541.12 + 576.8 + 542.67] : 518.4

See Abstr. 2297, 2298 541.123.4 : 531.19

See Abstr. 2285 541.123.6 : 516.3

2409 541.127

The mechanism of formation of orange II alumina colour lakes. VOET, A. *J. Phys. Chem.*, 47, *pp.* 191–196, *March*, 1943.

2410 541.127

Volatile borates of polyhydric alcohols and the activation of boric acid. RIPPERE, R. E., AND LAMER, V. K. *J. Phys. Chem.*, 47, *pp.* 204–234, *March*, 1943.—Orthoboric acid and the first 3 members of the homologous series of glycols react in equimolecular proportions with the elimination of 2 molecules of water to form volatile esters of definite composition. Propylene and ethylene glycols are strong activators of boric acid in acid-base titrations.

See Abstr. 2415, 2416 541.127 : 541.128

2411 541.127 : 541.64

On the kinetics of copolymerization. BRANSON, H., AND SIMHA, R. *J. Chem. Phys.*, 11, *pp.* 297–298, *June*, 1943.

2412 541.127.1

The rate of decomposition of hydrogen peroxide in concentrated solutions. LIVINGSTON, R. *J. Phys. Chem.*, 47, *pp.* 260–264, *March*, 1943.—Purified 83% H_2O_2 decomposes with a rate of 3×10^{-7} moles/l./sec. when 1 cm.³ samples are kept in small Pyrex vessels at 25°C. The heat of activation is 16 000 cal. This low rate was obtained only in solutions which had been freed from dust by low-temp. distillation, or in solutions to which inhibitors had been added. The decomposition of conc. solutions, in glass containers, occurs by at least 2 independent paths.

2413 541.128

The catalytic dehydrogenation of alcohols to aldehydes in the presence of air. DAVIES, R. R., AND HODGSON, H. H. *J. Chem. Soc.*, *pp.* 282–284, *June*, 1943.—The catalytic dehydrogenation of butyl, dodecyl and benzyl alcohols mixed with air was studied in the vapour phase; the optimum yield of aldehyde depends on a sp. air/alcohol ratio for each alcohol.

2414 541.128

The catalytic hydrogenation of benzene over metal catalysts. EMMETT, P. H., AND SKAU, N. *J. Amer. Chem. Soc.*, 65, *pp.* 1029–1035, *June*, 1943.—Cu catalysts free of Ni are inactive at 200° though their surface areas are several-fold those of active Co catalysts. Cu containing small Ni additions is slightly active at 200°. Pd is active; Ag is inactive. CO is chemisorbed on both reduced Cu and reduced Ni catalysts instantly at − 195°. CO_2 is chemisorbed at − 78° on Ni catalysts prepared by reduction of oxide formed by alkali precipitation but is not chemisorbed on Cu.

2415 541.128 : 541.127

Kinetics of ammonia synthesis. EMMETT, P. H. AND KUMMER, J. T. *Industr. Engng Chem.*, 35, *pp.* 677–683, *June*, 1943.—A recent paper by Temkin and Pyzhev suggested fundamental equations for the rate of adsorption and desorption of N on Fe catalysts and for the equilibrium pressure of N over such catalysts; they lead to a theory for the catalytic synthesis and decomposition of NH_3 which is the most satisfactory proposed to date. Predictions of their kinetics are tested by applying them to some hitherto unpublished data on the rate of synthesis as a function of gas composition, pressure, space velocity and temperature.

2416 541.128 : 541.127

Kinetics in acid media. DEANE, C. W., WITH HUFFMAN, J. R. *Industr. Engng Chem.*, 35, *pp.* 684–694, *June*, 1943.—Catalysts for the condensation of *o*-benzoylbenzoic acid to anthraquinone in the presence of concentrated and fuming H_2SO_4 have been sought by kinetic measurements; flasks were held at const. temperature in an oil thermostat and other conditions were varied systematically. The only added substance which promoted the reaction velocity was SO_3. The reaction is unimolecular, practically quantitative, inhibited by the water and to a greater extent by the anthraquinone formed during the reaction.

2417 541.128.24

The autoxidation of ascorbic acid. PETERSON, R. W. AND WALTON, J. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1212–1217, *June*, 1943.—In the absence of Cu very slow autoxidation of ascorbic acid occurs below *p*H 8·0; but as the *p*H is increased above this value, the rate of reaction increases until in highly alkaline solutions it is extremely large. In the presence of Cu the reaction takes place readily in both acid and alkaline solutions. A min. rate of oxidation occurs betw. *p*H 8 and 10 and a max. rate between 6 and 8, the exact values being dependent upon the experimental conditions. The inhibiting effects of a number of substances were determined.

2418 541.128.3

Catalytic reduction by formic acid under pressure. II. A comparison of copper and nickel as catalysts. DAVIES, R. R., AND HODGSON, H. H. *J. Chem. Soc.*, *pp.* 281–282, *June*, 1943.—Cu, when used as catalyst in conjunction with formic acid, promotes non-nuclear reduction exclusively. Ni promotes nuclear reduction.

2419 541.132

The dissociation constants of some acids in mixed solvents. SPEAKMAN, J. C. *J. Chem. Soc.*, *pp.* 270–273, *June*, 1943.—Thermodynamic dissociation constants of some dibasic acids in aq. alcohol and aq. dioxan were determined using the glass electrode with a cell involving liquid/liquid potentials.

2420 541.132

The basic ionization constant of glycine in dioxane-water solutions. HARNED, H. S., AND BIRDSALL, C. M. *J. Amer. Chem. Soc.*, 65, *pp.* 1117–1119, *June*, 1943.

2421 541.133

The conductivity of sulphuric acid in methanol at 5°. KANNING, E. W., BOBALEK, E. G., AND BYRNE, B. *J. Amer. Chem. Soc.*, 65, *pp.* 1111–1116, *June*, 943.—The conductivity was measured over the conc. ange of 0·02107 to 0·00006006 molar. At conc. < ·002 molar, the molar conductance is a linear function of the √conc. The data yield an approx. value f 0·029 for the primary dissociation const. at 25°.

2422 541.133.1

Migration data in solutions of a colloidal electrolyte: aurylsulphonic acid. MCBAIN, M. E. L. *J. Phys. hem.*, 47, *pp.* 196–204, *March*, 1943.—Electrolytic ransfer numbers of solutions of laurylsulphonic acid ere measured over a wide range of conc. The ansport number of sulphonate radical rises from that f the simple ions at infinite dilution to a 6-fold rger sharp peak in 0·055 *m* solution, where diffusion hibits a min., but where conductivity and osmotic oeff. are still falling off.

2423 541.134 : 621.357

Studies on overvoltage. XVI. Cathodic and anodic olarization of a platinized platinum cathode near the eversible value in nitrogen-saturated acid solutions. ERGUSON, A. L., AND TOWNS, M. B. *Trans. Electrohem. Soc.*, 83, *Prepr. No.* 9, [7 *pp.*], 1943.—[See bstr. 2250 (1943)]. A study is made of the changes n potential with time of a platinized Pt electrode in cid solution as current is passed through it, sometmes in the cathodic direction and sometimes in the nodic direction. The solution is at all times saturated with N.

2424 541.135.5

The Donnan membrane equilibrium. CHAUDHURY, . G. *Nature, Lond.*, 152, *pp.* 76–77, *July* 17, 1943.

2425 541.138.2

Polarization at oxidation-reduction electrodes. . The ferrocyanide-ferricyanide electrode. CARMODY, V. R., AND ROHAN, J. J. *Trans. Electrochem. Soc.*, 3, *Prepr. No.* 11, [9 *pp.*], 1943.—Polarization studies ere made of the $Fe(CN)_2$-$Fe(CN)_3$ electrode as anode nd as cathode with Pt and Au electrodes using c.d. p to 100 mA./cm.^{2} The chem. polarization is small ut definite; it is reproducible when the same preminary treatment is applied and is the same at anode nd cathode of the same metal. It is a linear function f the c.d., its value being approx. 0·2 V/A/cm.^{2} at mooth Pt and less at platinized Pt and Au.

2426 541.141.1

The action of light on acetaldehyde vapour. WOOLAR, C. W., AND ALLMAND, A. J. *Trans. Faraday oc.*, 39, *pp.* 219–225, *July–Aug.*, 1943.—The behaiour of acetaldehyde in ultra-violet light was xamined, the proportion of the starting material ndergoing reaction being higher than in quantitative udies reported during recent years. Large quantiies of a liquid polymer are produced, the rel. degrees f decomposition and polymerization depending on he experimental conditions. The only simple exlanation of the data involves the formation of acetone s a reaction product. Quantum-efficiency measureents are reported.

2427 541.144.8

The photo-oxidation of chlorophyll. ARONOFF, S., ND MACKINNEY, G. *J. Amer. Chem. Soc.*, 65, *pp.* 956–958, *May*, 1943.—The photo-oxidation of chlorophylls *a* and *b* is studied kinetically. The reaction is of the second order, and has a low quantum efficiency. A protective action of carotene on the destruction of chlorophyll is noted, attaining a const. value at a mole ratio of approx. 1 : 8.

2428 541.147.2 : 771.53

Optical sensitizing of silver halides by dyes. IV. The optical sensitizing properties of fluorescein dyes in relation to their spectral absorption and constitution. SHEPPARD, S. E., LAMBERT, R. H., AND WALKER, R. D. *J. Chem. Phys.*, 11, *pp.* 263–275, *June*, 1943.—[See Abstr. 580 (1941)]. With increasing wt. of halogen introduced, the principal visible absorption moves to longer waves, as also the first ultra-violet band. At the same time the acid dissociation constants of the phenolic and carboxylic groups tend to become indistinguishable, while the solubilities of the Ag compounds decline. The solubility of Ag erythrosinate varies with ageing and particle size; the solubility on adsorption to AgBr is lower than that of the pure compound. The adsorption is oriented, an edge-on or end-on monolayer being formed. Although not irreversible, there is a peculiar deviation from the Langmuir isotherm. The sensitizing occurs by a mechanism similar to that with basic dyes. Initially, transfer of an exciton to the Ag halide is indicated, rather than of an electron.

See Abstr. 2361 541.182 : 537.363

See Abstr. 2309 541.182.2 : 532.694.1

See Abstr. 2332 541.182.4 : 535.434

2429 541.182.5

Theory of dissolution of gels. TOBOLSKY, A. *J. Chem. Phys.*, 11, *pp.* 290–293, *June*, 1943.—A theory of the dissolution of 3-dimensional cross-linked polymers is presented. The existence of a definite melting temperature is discussed in terms of mol. constants characterizing the gel.

2430 541.183

The theory of chromatography. DEVAULT, D. *J. Amer. Chem. Soc.*, 65, *pp.* 532–540, *April*, 1943.—The simple theory [Abstr. 2347 (1940)] predicts both sharp and diffuse boundaries to the bands formed and developed in the chromatographic column. When only 1 solute is present, if the adsorption isotherm is of the usual type, the front boundary of the band will be sharp and will tend to sharpen itself in spite of diffusion etc., while the rear boundary will be broad and gradual. Equations are developed, applicable to a wide variety of conditions. The partial differential equations for multiple solutes are also given, and the discontinuous solutions for multiple solutes are discussed separately, although no general solution has been obtained. In the typical 2-solute case the conc. of the faster moving solute in the band where it is pure tends to be larger than in the original solution. It is suggested that more information about adsorption isotherms can be obtained from the diffuse boundaries of chromatograms than from the sharp ones.

2431 541.183

Chromatography as a means of separating amino acids. WACHTEL, J. L., AND CASSIDY, H. G. *J. Amer. Chem. Soc.*, 65, *pp.* 665–668, *April*, 1943.—A method utilizing chromatographic analysis on adsorp-

tion columns of a commercial charcoal for the separation of a mixture of glycine, *dl*-leucine, *dl*-phenylalanine and *l*-tyrosine is given.

2432 541.183

Adsorption of riboflavin by lactose. Influence of concentration. LEVITON, A. *Industr. Engng Chem.*, 35, *pp.* 589–593, *May*, 1943. H. H. HO.

2433 541.183.2

Water adsorption by animal glue. MASON, C. M., AND SILCOX, H. E. *Industr. Engng Chem.*, 35, *pp.* 726–729, *June*, 1943.—The adsorption of water on thin films of 5 animal glues and one gelatin are investigated, the glues covering the range of physical properties commonly employed. Water is held by glue in 2 forms—by true adsorption on the glue surface and by some other mechanism in the voids of the glue itself.

2434 541.183.596

Sorption of NH_3 on montmorillonitic clay. CORNET, I. *J. Chem. Phys.*, 11, *pp.* 217–226, *May*, 1943.—Various dry minerals were made to react with anhyd. NH_3 under controlled conditions, and sorption isotherms were obtained with NH_3 bentonite, K bentonite and finely ground H bentonite. X-ray studies indicated that the inflection and subsequent portion of the sorption curve were accompanied by widening of the *c* axis spacing. Results indicate that the sorption of NH_3 by unground H montmorillonite occurred on exterior planar surfaces, interplanar surfaces, broken bonds, corners and edges. For NH_3 bentonite sorbed NH_3 occupied base-exchange reactive spots. Data accord with the theory that both lattice OH ions and polarization of H_2O molecules may give rise to base-exchange capacity on grinding some clay minerals. N. M. B.

2435 541.48

Lyotropic order and the effects of sodium salts on the miscibility of cyclohexane and methyl alcohol. ECKFELDT, E. L., AND LUCASSE, W. W. *J. Phys. Chem.*, 47, *pp.* 183–189, *Feb.*, 1943.—An explanation for the lyotropic order of salting action in liquid-liquid systems is proposed which attempts to cover order inversion as in the cyclohexane–methyl-alcohol system. Salting action depends upon the electrostatic effect, compound formation and ionic polarization.

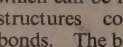
2436 541.6 : 53

Paraffin hydrocarbons. FRANCIS, A. W. *Industr. Engng Chem.*, 35, *pp.* 442–449, *April*, 1943.—The b.p., densities and refr. indices of all possible octanes, nonanes, decanes and undecanes are calculated from the same properties of the next lower paraffins from which they can be derived by substitution of a methyl group for a H atom. The agreement betw. the sep. calculations of the same property, and betw. these and the obs. values, justifies the selections of means as properties of unknown isomers. Paraffin isomers with 2 branches on non-adjacent C atoms have identical b.p.

See Abstr. 2328 541.6 : 535.343

2437 541.61

The structure of the boron hydrides. LONGUET-HIGGINS, H. C., AND BELL, R. P. *J. Chem. Soc.*, *pp.* 250–255, *June*, 1943.—It is suggested that the hydrides of B contain the bridge linkag



which can be formulated as a resonance hybrid betw structures containing only normal electron-pai bonds. The borohydrides of Be and Al are accounte for by the same hypothesis. The experimental dat for the electron diffraction, Raman spectrum, infra red spectrum, and sp. ht. of diborane are analyse and shown to support a bridge configuration rathe than one resembling ethane.

2438 541.62

On the number of structural isomers in simple rin compounds. I. HILL, T. L. *J. Phys. Chem.*, 47 *pp.* 253–260, *March*, 1943.

See Abstr. 2291 541.62 : 519.41

2439 541.64

The polymerization of styrene in the presence o nitrobenzene, 2,4-dinitrochlorobenzene and nitro methane. PRICE, C. C., AND DURHAM, D. A. *J. Amer. Chem. Soc.*, 65, *pp.* 757–759, *May*, 1943.—Th elements of nitrobenzene and 2,4-dinitrochlorobenzen have been found in polystyrene prepared in th presence of small amounts of these aromatic nitro compounds. This indicates that the retarding effec of such compounds is due to their coupling with th active growing polymer chain.

See Abstr. 2411 541.64 : 541.127

2440 541.64 : 679.5

Vinylidene chloride polymers. REINHARDT, R. C *Industr. Engng Chem.*, 35, *pp.* 422–428, *April*, 1943.— Copolymerizations of vinylidene chloride with sub stituted ethylenes (particularly with the common viny compounds), with dienes and their derivatives, an with a number of other saturated compounds, ar discussed. The structure of the polymers is illus trated by X-ray photographs; the unit cell of poly vinylidene chloride is monoclinic and contains $-CH_2$-CCl_2-units. Phenomena associated wit crystallinity are described. The polymers and copo lymers exhibit orientation when either the crystallin or amorphous modifications are mech. worked, bu the degree of orientation produced may vary, depend ing on the polymer composition and treatment. Nev methods of fabrication are briefly described, and note on physical properties and uses is added. H. H. HO

See Abstr. 2377 541.653 : 538.614

See Abstr. 2351 541.66 : 536.42

See Abstr. 2369 541.67 : 538.224

2441 542.67

Filtration cylinder. DEGRAY, R. J., AND RITTERS-HAUSEN, E. P. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *p.* 392, *June* 15, 1943.

See Abstr. 2287 542.67 + 541.12 + 576.8] : 518.4

2442 543.812 : 676.6 : 621.317.39

An instrument to measure minute changes in specific inductive capacity of cardboard and hence to determine its water content. GARDINER, S. D. *J. Soc. Chem. Ind., Lond.*, *pp.* 75–76, *May*, 1943.—[Abstr. 2076 B (1943)].

2443 544.12

The absence of coprecipitation of barium ion with the chlorides of the silver group and the sulphides of the copper and tin groups in the presence of ammonium ion. LEHRMAN, L., AND MANDEL, I. *J. Phys. Chem.*, 47, *pp.* 264–266, *March*, 1943.—No coprecipitation (adsorption, occlusion, or postprecipitation) of Ba ion takes place when the sulphides of the Cu and Sn groups are precipitated in the presence of NA_3 ion. No coprecipitation of Ba ion takes place when the chlorides of the Ag group are precipitated.

CRYSTALLOGRAPHY

2444 548 : 621.357.7

The structure of electro-deposited chromium. HUME-ROTHERY, W., AND WYLLIE, M. R. J. *Proc. Roy. Soc. A*, 181, *pp.* 331–344, *July* 28, 1943.—The visual appearance and crystal structure orientation of electro-deposited Cr were studied for deposits prepared at c.d. from 50–3 000 A/ft.^{2}, and from 12°–75°C., using a std. bath containing 250 g. CrO_3 per l. and a ratio of CrO_3 to sulphate ion of 100 : 1. With increasing variation of the conditions of deposition from those characteristic of the brightest deposits, (*a*) an increasing number of particles of purely random orientation are present in the deposit, and (*b*) the perfection of alignment of the particles of preferred orientation becomes less. The residual stress was measured by the method of Stoney. The hardness was measured for deposits prepared over the range 15°–90°C.

2445 548.33

The polymorphism of arsenious oxide. SCHULMAN, J. H., AND SCHUMB, W. C. *J. Amer. Chem. Soc.*, 65, *pp.* 878–883, *May*, 1943.—The monoclinic form of As_4O_6 is thermodynamically stable with resp. to the more common octahedral form at temperatures of 2°. Based upon the measured temperature dependence of the solubilities, an enantiotropic relation is shown to exist betw. the two forms with transition temperature about − 13°, while the heat of solution of both forms in 1 *M* HCl was calculated from the same data and found to agree with a calorimetric measurement. The v.p. of both forms were measured. The vapours of several substances were ineffective for accelerating the transformation of octahedral to monoclinic As_4O_6 at 180°, while the effectiveness of water vapour at this temperature was confirmed. H. H. HO.

2446 548.33

Polymorphism of bismuth trioxide. SCHUMB, W. C., AND RITTNER, E. S. *J. Amer. Chem. Soc.*, 65, *pp.* 1055–1060, *June*, 1943.

2447 548.33 : 535.323

Polymorphism of phosphoric oxide. HILL, W. L., FAUST, G. T., AND HENDRICKS, S. B. *J. Amer. Chem. Soc.*, 65, *pp.* 794–802, *May*, 1943.—The m.p. and monotropic relationship of 3 crystalline forms of P_2O_5 were determined by the method of quenching. Previous v.p. data are discussed and interpreted to establish a p./t. diagram (70°–600°) for the 1-component system. The system involves 3 triple points, corresp. to the hexagonal, orthorhombic and stable polymorphs, respectively, and at least 2 distinct liquids, one a stable polymer of the other, which are identified with the melting of the stable form and the hexagonal modification, respectively. Indices of refraction of the polymorphs and glasses were determined.

2448 548.73

The structure of molecular compounds. I. The crystal structure of *p*-iodoaniline–*s*-trinitrobenzene. POWELL, H. M., HUSE, G., AND COOKE, P. W. *J. Chem. Soc.*, *pp.* 153–157, *April*, 1943.—All the atomic positions have been determined by 2- and 3-dimensional Fourier analysis. There are no intermolecular distances less than the usual separations in molecular crystals. All formulae for the compounds involving a covalency betw. the molecules are excluded. The closest approach of the 2 molecules is betw. the amino-group and some O atoms of nitro-groups, which at most corresp. to a very weak H bond. One nitro-group approaches the aromatic ring of the *p*-iodoaniline molecule, but not closer than in crystals of picryl iodide, and interaction of the molecules may occur here.

2449 548.73

The crystal structure of Pb_3O_4. GROSS, S. T. *J. Amer. Chem. Soc.*, 65, *pp.* 1107–1110, *June*, 1943.—The positions of the Pb ions were determined from X-ray intensity values; application of the co-ordination theory confirmed these positions and placed the O ions. The plumbic ions are associated in chains of co-ordinated O octahedra with opposite edges shared. These chains are arranged in a parallel manner, so that shared and unshared oxygen ions from adjacent chains approach closely and 3 O ions are co-ordinated with each plumbous ion. The plumbous-ion arrangement is the same as in red PbO.

2450 548.73 : 536.413

Structure and thermal properties of crystals. V. Thermal expansion of phthalocyanines and porphins. UBBELOHDE, A. R., AND WOODWARD, I. *Proc. Roy. Soc. A*, 181, *pp.* 415–427, *July* 28, 1943.—Measurements were made on the changes in lattice spacing of various phthalocyanines, from 90°–600°K. Visual estimates were obtained of changes in the intensities of reflections with rise in temperature. The molecular movements in the crystals are calculated from the exp. data. Apparatus described includes a new design of furnace, suitable for use with various X-ray cameras for single-crystal work, and a moving-film oscillation camera. [See Abstr. 608 (1940)].

See Abstr. 2363 548.73 : 537.531 : 535.312

GEOPHYSICS

2451 550.385

Magnetic activity at Dombås based on absolute storminess for the horizontal component. WASSERFALL, K. F. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 29–40, *March*, 1943.—A new index of magnetic activity, based on the absolute storminess in the horizontal component of the Earth's field, is developed from Dombås data extending over the period 1923–33 and compared with the international 3 hr.-range index. Mean monthly indices, annual means of the diurnal variation, and annual mean frequencies of occurrence of the various index values are given in tabular form, and graphs show other features of the data, incl. the variation with sunspot number. A. HU.

See Abstr. 2384 550.422 : 539.163

See Abstr. 2456 551.311.125 : 551.51

2452 551.464(261)

Note on the variations of salinity of the surface waters of the Irish Sea. PROUDMAN, J. *Mon. Not. Geophys. Suppl. Roy. Astr. Soc.*, 5, 3, *pp.* 67–70, 1943.

2453 551.501.45

Interpolation tables for daily values of meteorological elements. BROOKS, C. E. P. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 160–162, *April*, 1943.—An algebraical method is developed for estimating from monthly mean data the average date on which some meteorological element reaches a certain level, or the average value of the element on a specified date. Where the values of the element can be represented over 3 months covering the required date by a sine curve with an annual period, the method gives results as good as those from any other interpolation formula and better than those obtained by drawing a smooth curve through the plotted monthly means. A. HU.

2454 551.506.1(42)

Meteorological observations at the Royal Observatory, Greenwich, during the year 1942. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 145–146, *April*, 1943.

2455 551.508.71

Improvement of dew-point determination. AKKER, J. A. VAN DEN, AND WINK, W. A. *Science*, 97, *p.* 494, *May* 28, 1943.

2456 551.51 : 551.311.125

The glacial anticyclone and the European continental glacier. HOBBS, W. H. *Amer. J. Sci.*, 241, *pp.* 333–342, *May*, 1943.—The author develops his theory that the geological work of a continental glacier is accomplished during a short warm period by thaw water and floating ice-blocks which cause glacio-fluvial deposits with stranded ice-borne boulders at the ice front. For the rest of the year, fierce winds directed outwards from the glacial anticyclone lay down loess deposits beyond the outwash and produce ventifacts from the boulders. The theory is discussed and its main points verified from a consideration of the latest glaciation of Europe. A. HU.

2457 551.521.63

Measurements of ultra-violet solar radiation in Washington, 1936 to 1942. COBLENTZ, W. W., AND STAIR, R. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 434–448, *June*, 1943.—Continuing earlier work [Abstr. 4084 (1936)], a summary is given of measurements during 1936–1942 in Washington, D.C. Marked variations in the spectral quality and total intensity of ultra-violet solar radiation, attributable to variations in atmospheric turbidity and to cyclonic and seasonal changes in ozone conc. in the stratosphere, are recorded. On the clearest days the biologically effective ultra-violet of wavelengths $< 3\,132$ Å, incident directly from the sun and the surrounding sky at midday, ranges from 75 μW/cm.^{2} in midsummer to 12 μW/cm.^{2}

See Abstr. 2317 551.571 : 533.275

2458 551.586

The reactions of the human body to its physical environment. BRUNT, D. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 77–114, *April*, 1943.—An investigation of the heat transfers and equilibrium of the body in different conditions. Heat derived by metabolism is balanced by radiation, convection and evaporative loss from the skin; these are investigated separately, and curves are plotted of their relation to ambient temperature and humidity. Control of equilibrium temperature of the body is exercised mainly by changing the evaporative loss, this being altered chiefly by varying the area of evaporation. Optimum temps. and humidities for different kinds of activity are discussed, and curves given of the lim. values of these two quantities within which body control of temp. can be maintained. F. T. F.

VARIOUS SUBJECTS

See Abstr. 2306 576.35 : 532.6/.7

See Abstr. 2287 576.8 + 542.67 + 541.12] : 518.4

2459 577.15

The physico-chemical basis of mitogenetic radiation. FRENKEL, Y. I., AND GURVICH, A. G. *Trans. Faraday Soc.*, 39, *pp.* 201–204, *July–Aug.*, 1943.

See Abstr. 2280, 2281 581 : 51

See Abstr. 2290 581 : 531.314 : 519.3

See Abstr. 2356 581 : 537

2460 591.181

Electrical responses from the primary acoustic centre of the frog. EK, J., AND EULER, C. L. v. *Nature, Lond.*, 152, *p.* 132, *July* 31, 1943.

See Abstr. 2313 612.2 : 533.15

See Abstr. 2399 666 : 539.4.013

See Abstr. 2388 666.1/.2 : 539.501 : 539.213

See Abstr. 2405 669.14 : 620.16 : 539.434

See Abstr. 2353 669.18 : 621.317.39.082.62 : 536.52

See Abstr. 2397 674.04 : 539.388.8

See Abstr. 2299 676 : 531.714.7

See Abstr. 2442 676.6 : 621.317.39 : 543.812

See Abstr. 2440 679.5 : 541.64

See Abstr. 2352 679.5 : 536.468

See Abstr. 2398 679.5 : 539.4.013/.019

See Abstr. 2391 77 : 539.215.4

2461 77.012

A method for removing microscopic fog from photographic plates. LIEBERMANN, L. N., AND BARSCHALL, H. H. *Rev. Sci. Instrum.*, 14, *pp.* 89–90, *April*, 1943.—The basic idea is, prior to use, to develop the unexposed plate and reduce all of the developable AgBr grains to free Ag, this being then removed by the commonly used process of photographic reduction. Removal of the fog makes a greater number of emulsions available for recording tracks of nuclear particles. A. H.

See Abstr. 2428 771.53 : 541.147.2

See Abstr. 2386 778.31 : 539.185.08 : 539.164.08